Master's thesis proposal spring 2024

Carbon stability in sludge biochars

Background

The use of municipal sewage sludge as a phosphorus fertiliser and soil conditioner on farmlands has been debated for decades due to the pre-cautionary principle concerning dispersal and accumulation of pollutants. Sludge spreading on farmland is banned in Switzerland and Germany, and in 2024 a suggested update of the 37-year-old EU directive on sewage sludge will be published.

Production of biochar through pyrolysis of sewage sludge seems to degrade organic micropollutants. Some heavy metals, e.g. cadmium, will be vaporised and then trapped in the gas condensate, while the biochar still contains all the phosphorus. Making biochar from sludge could therefore be a way to make the sludge cleaner without losing the ambition of P recycling.

Biochar from wood is a well-known carbon sink, i.e. the carbon in the biochar will be stabilised in the soil for thousands of years. Sewage sludge biochar have other characteristics such as a much higher ash content compared to wood biochar, which may can affect the carbon stability.

The municipal association VA SYD, which operates the wastewater utilities in Malmö, Lund, Burlöv, Eslöv och Lomma, are now performing a pilot project on sludge pyrolysis, at the Ellinge Wastewater Treatment Plant (WWTP) in Eslöv, called Testbed Ellinge.

The pilot will pyrolyse sludge from different WWTPs in Sweden to investigate the difference in sludge biochar characteristics depending on the choice of wastewater treatment processes and sludge treatment and the pyrolysis unit operating conditions.

Objective

The main objective of this thesis project is to investigate the carbon stability in different sludge biochars.

Method

Carbon stability in sludge biochars will be studied by using two different approaches. One will be an incubation with a soil. In this experiment the CO_2 mineralisation is monitored over time and compare against a reference soil sample in order to determine the contribution by biochar. As a complement to the incubation study some chemical tests of the stability of the sludge biochars will be performed.

When?

Spring 2024

Interested in this Master´s thesis?

Contact one of the supervisors for the project:

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Testbädd Ellinge